In the Claims

The following listing of claims will replace all previous listings of claims in the Application:

1. (Presently Amended) A method of synchronizing the operation of first and second quantum key distribution (QKD) stations of a QKD system, comprising:

a) establishing in each QKD station respective receive and transmit timing domains that are connected between the QKD stations via a timing channel;

b) transmitting in a continuous mode from the first station to the second station frames of quantum signals emitted by a first laser source over a quantum channel connecting the first and second stations, wherein the quantum signals are not interrupted by non-quantum optical timing signals;

c) transmitting over the timing channel optical synchronization signals emitted by a second laser source, wherein the optical synchronization signals include frame sync pulses and data pulses; and

d) coordinating the ~~continuous mode~~ transmission in continuous mode of the quantum signals, encoding of the quantum signals and detecting of the encoded quantum signals by locking the receive and transmit domains of the two QKD stations using the optical synchronization signals.

2. (Previously Amended) A method according to claim 1, including multiplexing the quantum signals and optical sync signals onto a common optical transmission medium linking the first and second QKD stations.

3. (Presently Amended) The method of claim 1, wherein forming the optical sync signals includes:

~~a)~~ generating an electrical sync signal using a field-programmable gate array (FPGA);

~~b)~~ receiving the electrical sync signal at an optical transmitter; and

~~c)~~ converting the electrical sync signal to the optical sync signal.

4. (Previously Amended) The method of claim 1, including sending the optical sync signals between a first optical modem in the first QKD station and a second optical modem in the second QKD station, wherein the first and second optical modems each have an optical transmitter that includes said second laser, and an optical transceiver coupled to a circulator, and wherein the circulators are connected to the timing channel.

5. (Original) The method of claim 4, including coordinating the operation of the optical transmitters and optical receivers in the first and second modems with first and second phase-lock loops (PLLS) in the first optical modem, and a third PLL and a transmit clock in the second optical modem.

6. (Presently Amended) The method of claim 1, wherein encoding the quantum signals includes:

~~a)~~ generating random numbers from a random number generation unit having a plurality of data sources that generate data and that are coupled to a data source selector;

~~b)~~ selecting one of the data sources using the data source selector; and

~~c)~~ delivering the data from the selected data source to a modulator driver.

7. (Presently Amended) The method of claim 6, wherein a modulator is coupled to the modulator driver, and including:

~~a)~~ providing a gating signal to the modulator driver that coordinates the activation of the modulator driver with the arrival of one of the quantum signals at the modulator based on the synchronization signals; and

~~b)~~ encoding the quantum signal with the modulator.

8. (Presently Amended) The method of claim 1, wherein transmitting the quantum signals in the continuous mode includes:

~~a)~~ forming from each quantum signal first and second quantum pulses at the first QKD station and transmitting the quantum pulses over the quantum channel to the second QKD station;

~~b)~~ at the second QKD station, randomly modulating one of the quantum pulses

and attenuating the quantum pulses to form weak quantum pulses; and

~~c)~~ sending both pulses to back to the first QKD station via the quantum channel; and

~~d)~~ randomly modulating the unmodulated pulse at the first QKD station.

9. (Presently Amended) The method of claim 1, wherein transmitting the quantum signals in the continuous mode includes:

~~a)~~ at the first QKD station, forming from each quantum signal first and second weak pulses, randomly modulating the first weak pulse and transmitting the modulated first weak pulse and the unmodulated second weak pulse over the quantum channel to the second QKD station; and

~~b)~~ at the second QKD station, modulating the second weak pulse and combining the now-modulated first and second weak pulses.

10. (Original) The method of claim 1, including electronically adjusting the transmitting and receiving domains in each QKD station to compensate for time delays introduced in at least one of the quantum channel and timing channel.

11. (Presently Amended) A QKD system having first and second QKD stations, wherein each QKD station includes:

a) a quantum transceiver coupled to a quantum channel, the quantum transceiver having a modulator driver and a modulator, and adapted to transmit and ~~and/or~~ receive quantum signals over the quantum channel in a continuous mode wherein the quantum signals are not interrupted by non-quantum optical timing signals;

b) a random number generator (RNG) unit coupled to the quantum transceivers, the RNG unit adapted to provide random numbers to the quantum transceiver so as to randomly encode a quantum signal passing through the modulator;

c) a public data transceiver (PDT) coupled to the RNG unit, the quantum transceiver and to a public channel;

d) an optical modem adapted to send and receive optical synchronization signals over a timing channel, the optical modem having an optical receiver and an

optical transmitter both coupled to a circulator, which is coupled to the timing channel; and

e) a controller operably coupled to the quantum transceiver, the RNG unit and the optical modem~~,~~; and

wherein the controller in the first QKD station is adapted to synchronize the operation of the quantum transceiver and the RNG unit in the first QKD station to the quantum transceiver and RNG unit of the second QKD station based on synchronization signals communicated between the controllers of the first and second QKD stations through their respective optical modems over the timing channel without interrupting the transmitting and/or receiving of quantum signals over the quantum channel.

12. (Presently Amended) A timing system for a QKD system having first and second QKD stations each having a quantum transceiver that transmits and receives quantum signals, the system comprising:

a) an optical modem in each QKD station, wherein each optical modem has circulator coupled to a laser-based optical transmitter and a receiver with an optical detector;

b) wherein one of the optical modems includes first and second phase lock loops (PLLs) coupled to the optical receiver and the optical transmitter located therein;

c) wherein the other optical modem includes a third PLL coupled to the optical receiver therein, and a clock coupled to the optical transmitter therein; and

d) a controller in each QKD station and operably coupled to the optical modem in the corresponding station, the controller being adapted to transmit and receive synchronization signals over a timing channel connecting the optical modems to synchronize the operation of the quantum transceivers, wherein the synchronization signals include frame sync pulses and data pulses and wherein the quantum signals are transmitted in a continuous mode such that the quantum signals are not interrupted by non-quantum optical timing signals.

13. (Presently Amended) A QKD system comprising:

a) first and second QKD stations each having a quantum transceiver with first

laser, a random number generator (RNG) unit, a public data transmission unit, an optical modem, and a controller, all operably interconnected within each QKD station;

b) a quantum channel connecting the quantum transceivers, which are configured to exchange frames of quantum signals over the quantum channel in a continuous mode wherein the quantum signals are not interrupted by non-quantum optical timing signals;

c) a public channel connecting the public data transmission units;

d) a timing channel connecting the optical modems, which each include a second laser for generating optical synchronization signals for transmission in a continuous-mode over the timing channel; and

e) wherein the optical modems transmit and receive said synchronization signals having frame sync pulses and data pulses that act to lock a receive timing domain to a transmit timing domain in each QKD station.

14. (Original) The QKD system of claim 13, wherein the timing channel and the public channel share a single physical connection between the two QKD stations.

15. (Original) The QKD system of claim 13, wherein the QKD system operates as a two-way system.

16. (Original) The QKD system of claim 13, wherein the QKD system operates as a one-way system.

17. (Previously Amended) The QKD system of claim 13, wherein one of the optical modems includes two phase lock loops and the other optical modem includes a phase lock loop and a clock that generates synchronization signals.

18. (Original) The QKD system of claim 13, wherein synchronization of the QKD stations is controlled by the controller of either QKD station.

19. (Previously Presented) The QKD system of claim 11, wherein one of the optical modems includes first and second phase lock loops (PLLs) coupled to the optical receiver and the optical transmitter located therein, and wherein the other

optical modem includes a third PLL coupled to the optical receiver therein, and a clock coupled to the optical transmitter therein.

20. (Previously Presented) The QKD system of claim 11, wherein the synchronization signals include frame sync pulses and data pulses.